Journal of Cuneiform Studies

Volume VI Number 4

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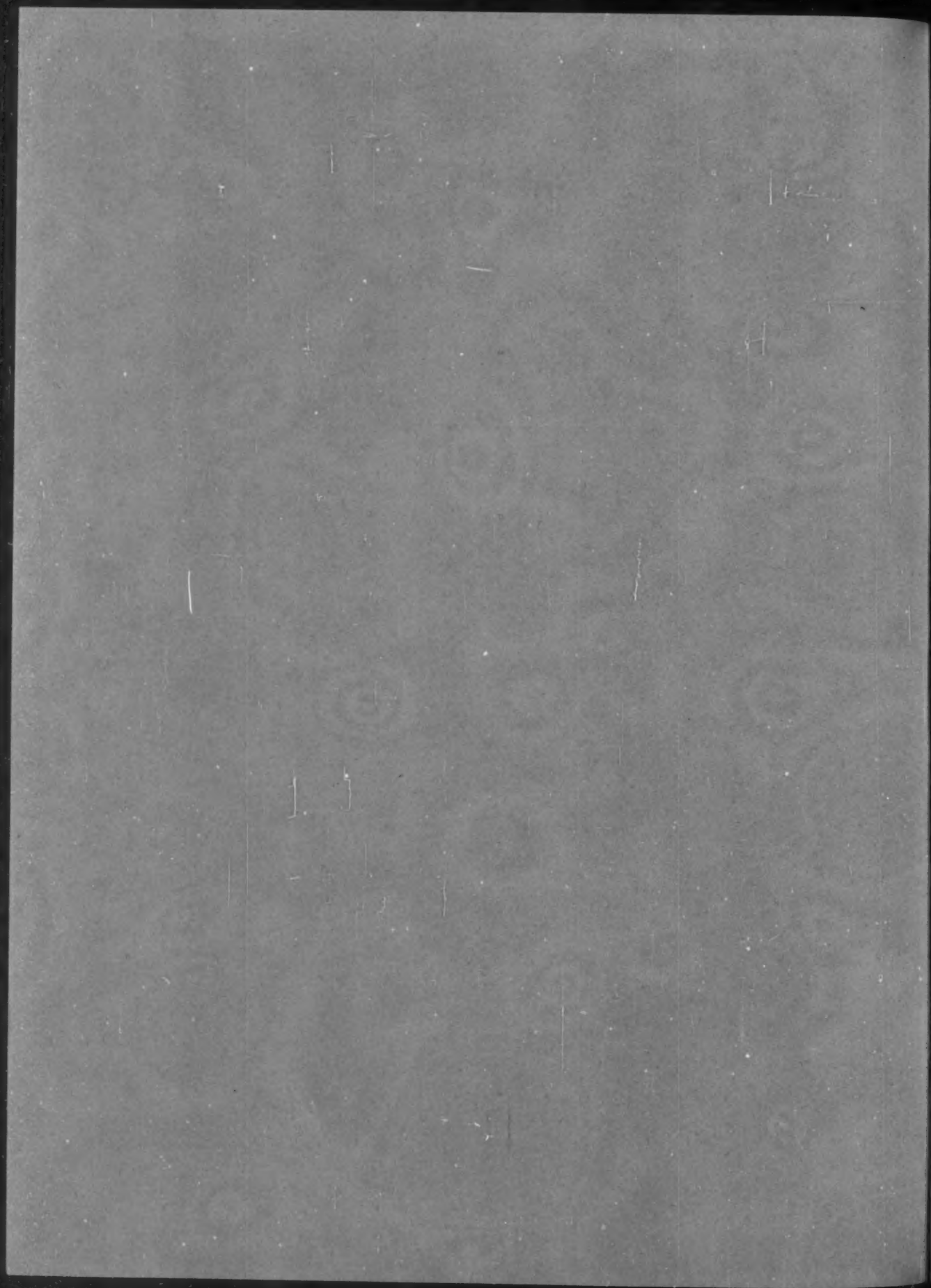
Published by
THE AMERICAN SCHOOLS OF ORIENTAL RESEARCH
DRAWER 93-A, YALE STATION
NEW HAVEN, CONNECTICUT, U.S.A.
1952



TWO LETTERS FROM DILMUN

P. B. Cornwall

Ross, California, U.S.A.

Since 1880–81, when Delitzsch[1] and Sir Henry Rawlinson[2] attacked the problem, Dilmun's probable location has frequently been discussed by geographers and Assyriologists. While a few scholars[3] have asserted that Dilmun must have lain somewhere on the Iranian side of the Persian Gulf, the majority have preferred to identify Dilmun with Bahrein Island — sometimes including a part of the nearby Arabian mainland.

In an article[4] published six years ago, the present writer summarized the arguments in favour of the latter theory, added some new evidence, and submitted that there should no longer be much doubt about the soundness of this identification. An inscription from the reign of Esarhaddon, just brought forward by Weidner, provides yet further proof;[5] and now the Nippur letters published herewith make it clear that Dilmun could not possibly have been on the eastern side of the Persian Gulf, and that the identification with Bahrein Island and part of the Saudi Arabian province of Hasa may be accepted without reservations.

Of these two cuneiform letters, Ni. 615 and 641 in the Museum of the Ancient Orient at Istanbul, the first has never been published before, the second has been dealt with cursorily.[6] Photographs are not available; but F. R. Kraus obligingly autographed the tablets for me, and to Albrecht Goetze I am greatly indebted for the transliteration, translation, and textual commentary published as an appendix to this article.

The two letters have been dated to the time of Burnaburiyaš (c. 1370 B.C.). Both are addressed by one Ilī-ippašra to Ililiya,[7] who is the sender's superior and quite clearly a high government official in Babylonia. I think it can reasonably be assumed that this Ililiya is none other than Ellil-kidinnī, *guenna* (governor) of Nippur during the reign of Burnaburiyaš and the first years of Kurigalzu III; for it has been shown by Kemal Balkan[8] that Il(i)liya is a hypocoristic form of Ellil-kidinnī, and it will be observed that both Ni. 615 and 641 imply familiarity through their general tone and the use of the term "brother".

That Ni. 615 and 641 actually were written at Dilmun is to be inferred not only from the greeting formula,[9] but also from other internal evidence. But in order to interpret the letters properly it will first be necessary to set the historical background, beginning by a brief survey of Dilmun's position before and after the time of Burnaburiyaš.

The earliest known records referring to Dilmun are administration documents of the First Dynasty of Lagash (c. 2500 B.C.). They show that continual trade existed at that time betweeen Sumer and Dilmun, and that the commodity most frequently imported from the latter was dates (*sulum-Dilmun*).[10]

Other texts, dating from late in the third and early in the second millennia, list as importations from Dilmun goods[11] which must, in fact, have

1. Wo lag das Paradies p. 229.

2. JRAS XII (1880) pp. 207ff.

3. Notably Jensen (ZA XV [1900–01] p. 225, Langdon (PBS X [1915] I p. 10), and Kramer (in his article "Dilmun, the Land of the Living," BASOR 96 [1944] pp. 18–28).

4. "On the Location of Dilmun," BASOR 103 (1946) pp. 3–11.

5. Cf. AfO XV (1951) pp. 169f.

6. By Schollmeyer, in Die Welt des Orients 1950 p. 355. See also Unger, Reall. der Vorg. 13 (1929) 313.

7. The same writer and addressee occur in BE XVII 88, a much mutilated tablet; and it is possible that the writer is the Ilī-ip-pa-aš-ra mentioned in BE XVII 31 line 15 and PBS I/2 71 line 18. None of these three tablets, however, provides pertinent data.

8. "Babil'de Feodalizm Araştirmalari. Kas'lar Devrinde Babil," Ankara Universitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi II/1 (1943) p. 50. (King Ellil-nirari of Assyria wrote two letters to Ellil-kidinni in which he addresses him as Ililiya, an abridged form of his name used as a token of friendship, and he calls him "my brother". I owe thanks to Kraus and Güterbock for making this valuable information available.)

9. See below, in the section on Enzag and Meskilak.

10. Cf. DP 383, 385, 393, 395, 396, 403, 408; Nik. 46, 47.

11. Copper (VAT 4760: cf. Förtsch RSO VIII [1916] pp. 165f.), prepared timber (Gudea Stat. D col. IV lines 7ff.), precious stones, metals, and ivory (UET I 244). Relics of this sort of trade occur in the Bahrein Bronze Age tumuli, where bronze and many fragments of ivory boxes and statuettes have been found. Cf. Mackay, Bahrein and Hemamieh pp. 21ff.; Cornwall, "The Tumuli of Bahrein," Asia and the Americas April 1943, pp. 230ff.

been brought to the latter place from more remote countries, and there is evidence that Dilmun occupied a key position on the trade routes then linking Sumer by water with Magan, Meluḫḫa, and other lands.[12] Indeed, the facts of geography made this inevitable, for between Mesopotamia and Oman the only suitable harbour is at Bahrein Island, which moreover has ample fresh water and a notable landmark.[13] The Persian Gulf is a treacherous body of water, with sudden squalls, dust-laden winds of high velocity, and numerous reefs and shoals along the Arabian coast. For early navigators Bahrein must have been a welcome haven.[14]

From the point of view of states at the head of the Persian Gulf, political control of the island obviously was considered desirable; we possess cuneiform texts showing that some sort of sovereignty over Dilmun was held (or at least claimed) by the following among the various rulers, who from c. 2360 B.C. onward, were in full or partial control of Southern Mesopotamia: Sargon of Akkad,[15] Gudea,[16] Shulgi,[17] Shu-Sin[18] Burnaburiyaš,[19] Tukulti-Ninurta I,[20] Sargon of Assyria,[21] Sennacherib,[22] Esarhaddon,[23] Ashurbanipal,[24] Nabonidus.[25]

12. See e.g. Albright JEA 6 pp. 91ff., JAOS 45 pp. 237ff., BASOR 119 p. 27; Ungnad AfO XIV (1942) pp. 199ff; Deimel Orientalia 30 pp. 29f.

13. In clear weather the central hills of Bahrein, which are called collectively Jabal Dukhan, are visible from a distance of about 25 miles, cf. Persian Gulf Pilot (1920) p. 132.

14. Note that one of Alexander the Great's officers, Archias, "who was sent with a thirty-oared ship to investigate the course of the coasting voyage to Arabia . . . went as far as the island of Tylus, but dared not pass beyond that point" (Arrian Anabasis VII 20). Tylus was the classical name for Dilmun-Bahrein, cf. Cornwall BASOR 103 p. 6 and the references there given in footnote 13.

15. Cf. KAV 92 (an Assyrian text, but believed to have been copied from an original of the Akkad period).

16. Cf. RISA p. 191 Gudea Stat. D.

17. Cf. AO 3474 (A royal messenger brings back from Dilmun two invalid officials of the king).

18. Cf. Janneau, Une Dynastie Chaldéenne p. 56 (Arad-Nanna, the *sukkalmaḫ*, claims among his titles that of prefect of Dilmun).

19. See Ni. 615 and 641, given herewith.

20. Cf. Luckenbill ARAB I 170.

21. Cf. ibid. II 43, 81 and passim.

22. Cf. ibid. II 438.

23. Cf. ibid. II 668.

24. Cf. ibid. II 970 ("Ashurbanipal . . . who established the yoke of his rule over Tyre, which is in the midst of the Upper Sea, and Dilmun, which is in the midst of the Lower Sea, and they drew his yoke.") Furthermore, an Assyrian province-list (K 4384), attributed to this reign, lists Dilmun among the territories belonging to the Empire, cf. Forrer, Die Provinzeinteilung des Assyrischen Reiches pp. 52-54, 101. For a mention of tribute brought from Dilmun at this time, see Waterman, Royal Correspondence of the Assyrian Empire I 458.

25. Cf. VAT 3071: see San Nicolò and Ungnad, Neubabylonische Rechts- und Verwaltungsurkunden I pp. 550f. (This tablet, dated in the eleventh year of Nabonidus, shows that Dilmun then had a *bêl piḫāti*, i.e. a Neo-Babylonian governor).

26. Cf. Balkan, loc. cit. He adds that during the reign of Kadašman-Ellil II, the king himself bore for a while the title of *guenna* of Nippur, which city was the center of administration in Middle Babylonia.

If their location, taken with the "pyramid" character of early trade, permitted the Dilmunites to play the perennial — and profitable — role of middleman, it is also manifest that they could not have been strong enough to dominate the trade routes themselves, to win and preserve full independence, or perhaps even to ward off raiding pirates or hostile tribes. It is understandable, therefore, that Dilmun tended to become a dependency of successive Mesopotamian states.

The history of Bahrein in mediaeval and modern times provides a striking parallel. Too small and barren ever to support a large population, and exposed on all sides to assault, the island has been taken over in turn by (among others) Sassanians, Ummayyads, Portuguese, Wahabis, the Ottoman Turks, and finally the English. Aside from the activities of oil companies, Bahrein is today about what it must have been during the first twenty-four centuries B.C.: an emporium, the antechamber of Eastern Arabia, a principal Gulf port, and the nominal vassal of the strongest sea power in those waters.

Turning again to our two Nippur letters, it is hardly surprising, consequently, to find that an official of the Cassite dynasty of Babylonia was present in Dilmun early in the fourteenth century, or that reports were dispatched by him to a superior whom we have identified as Ellil-kidinnī, the most brilliant figure among the known *guennas* of Nippur and in rank second only to the king.[26]

In Ni. 615 occur references to a number of other people, one of them a woman (who will be discussed later). It is interesting to observe that

wherever they can be read the names of the men are all good Akkadian: Iltānu, Sīn-nūrī, Nawir-Uraš, and Iddin-Nerīgal. The first of these may be a merchant or messenger, but the other three are clearly men holding positions of authority in Dilmun — and thus either officials or nobles who have been granted territory there. In any case, it seems plain that in Dilmun's administration the key positions were held not by indigenes but by Babylonians.[27]

The use of the word *ittabalkat* in Ni. 615, obv. 7f. implies that a body of water has been crossed[27a] — that Dilmun has been reached. But even so, the woman there spoken of has not yet "arrived"! The obvious explanation is that Ilī-ippašra is writing from the nearby Arabian mainland (which was also, as has been shown elsewhere,[28] territory of Dilmun). He has heard of her arrival in Dilmun proper (Bahrein Island), but as yet she has not traversed the straits.

The logic of this interpretation is borne out by other factors. As has been said, Bahrein was undoubtedly the way of entry into Eastern Arabia, and moreover it is on the mainland that are grown the dates long held to be the finest in the Arab world.[29] The Dilmun dates so often mentioned in cuneiform texts[30] must have come chiefly from the extensive date gardens near Qatif — and perhaps also from Hofuf — rather than from the comparatively small gardens on the island, which produce dates considered less desirable. And since dates were the principal export from Dilmun, the surveillance of their selection and packing was very likely one of the most pressing administrative duties.

In fact, in Ni. 615, obv. 14f, Ilī-ippašra complains that around his headquarters(?) the Aḫlamû have carried away the dates, while the next line surely implies a "strike" or the breaking off of negotiations. It is fairly obvious that the dates in question were not suddenly stripped from adjacent trees by the Aḫlamû, but rather that they had previously been picked, brought in, and made ready for shipment.[31] Ilī-ippašra's contacts with Aḫlamû likewise imply that he wrote from the mainland.

Assuming that the name Aḫlamû does not here have simply the meaning "Bedouin", the presence of Aramean[32] nomads near Bahrein Island at the time of Burnaburiyaš, while hardly surprising, is a matter of considerable interest.[33] It can be seen from our two letters that the Aḫlamû — a notoriously warlike and troublesome people — were at least temporarily out of hand, and that whatever authority the Babylonian officials may usually have had over them was quite tenuous.

Moreover, from various details in the letters emerges a blurred picture of two contrasting elements in the non-Babylonian population of Dilmun: first, an older element[34] of villagers, habituated to foreign control and probably well enough satisfied with that state of affairs; secondly, the intrusive Aḫlamû, nomadic invaders from the desert — part of the widespreading migratory movement of Aramean tribes during the second and first millennia.

In Ni. 615, rev. 2ff. occur ominous references to visions being seen and the destruction of the palace indicated. Such phenomena, not uncommon among superstitious folk at a time of tension, emphasize the precariousness of affairs in Dilmun when the letters were written.

27. As they are held today, on Bahrein Island, by Englishmen.

27a. Cf. Maqlû III:124 for *nabalkutu* used of crossing water.

28. Cf. Cornwall BASOR 103 p. 7; Deimel Orientalia 33 pp. 30f.

29. Cf. Burrows Orientalia 30 p. 6; Enc. of Islam s.v. "Hofhuf"; Zwemer, Arabia: the Cradle of Islam p. 124.

30. See e.g. note 10 above. In KAR 8, 13f. occurs the significant simile: "Babilu is a date of Dilmun, whose fruit is sweet".

31. DP 405 gives the following entry: 10 *gú-lal sum-Dilmun* "10 stringed bundles of Dilmun onions". For other such entries, cf. Deimel, Orientalia 17 p. 1ff.

32. E.g. Schiffer, Die Aramäer pp. 15ff.; Bowman JNES 7 (1948) pp. 66ff.

33. Note that in Ni. 615, obv. 8, *Sutētu* may stand for *Sutītu* and denote "Sutean woman". As is well known the Aḫlamû and the Sutû were related, and they are frequently linked in Assyrian inscriptions. (cf. e.g. ARAB I 73 [reign of Adad-Nirari I, c. 1300 B.C.] and see Bowman, loc. cit., pp. 69f.) We cannot tell why a Sutean woman may have been visiting Dilmun, but it is a fact that among nomadic folk in Northeastern Arabia women often were very prominent as queens and/or priestesses, cf. ARAB I 772, II 569, 943.

34. The presence in Dilmun of such a component, one definitely non-Babylonian, is strongly implied throughout Ni. 615. Other sources make it certain that such an element existed — that native Dilmunites had long been resident there. Cf. CT XV 44; RISA p. 191 Gudea Stat. D col. IV line 7 — col. V line 1. Other texts, as well as archaeological evidence (which I shall speak of later) likewise bear out this reasoning.

It is significant that Dilmun occupies a place in the geographic system of the astrological series, the text of which, according to Weidner,[35] must have been composed during the Cassite period. It would doubtless be rash to postulate a distinct connection between the calamities of the Dilmunites spoken of in Sin XXXIII and the difficult situation reported by our Nippur letters, and more so to suppose that the omen tablet may refer to *later* developments in Dilmun, with the Aḫlamû getting the upper hand. What does seem apparent, however, is that in Cassite times Dilmun was beset by troubles, which to judge from our two letters arose from the familiar, age-old conflict between townsman and nomad — the "have" and the "have not".

An important question, arising inevitably as one studies these letters from Dilmun, is whether any directly helpful information is to be gained from archaeological evidence. The topic cannot, of course, be treated exhaustively in these pages, but some remarks are too pertinent to be passed over.

On Bahrein Island are tens of thousands of sepulchral tumuli. They are of two general types: the first, resembling either cairns or pill-boxes and constructed solely of limestone rock, are usually located on slopes or rock benches; the mounds of the second type (which predominate) are larger and generally conical "earth mounds", almost always containing a chamber, the entrance to which faces the West or Southwest.

These tumuli have long been known and intermittently examined. The earth mounds have yielded pottery which suggests a Third Dynasty of Ur—Larsa range,[36] i.e. 2060–1700 B.C.[37] And in a mound of this class the writer found a spatula datable to about the beginning of the second millennium.[38]

It is probable that these earth mounds — which, though very numerous, seem to have been provided for only a fraction of the population — have a wide date-range. Their building may well have begun at the end of the third millennium and continued through most of the second.

The nature of the mortuary furnishings, the type of the skeletal material, and the total absence of inscribed objects — all lead to a conclusion that is quite in accordance with historical data: namely, that these mounds must be the tombs of an indigenous people. It certainly was not Sumerian and was in all probability — as today — Semitic.

So little has been recovered from the island's rock tumuli that their date can only be guessed at. Yet because of their similarity to the earth mounds, as well as their juxtaposition, it is reasonable to assume that whether the bulk of them are earlier, later, or contemporaneous they were built if not by the same people (as seems most likely) then at any rate by men with an identical racial and religious background.

In the tumuli of both types which I examined, whenever there is an entrance it nearly always faces the Southwest, and I found that true also of the axis of cists in chamberless rock mounds. Mackay[39] favoured the theory that the tomb doorways faced this people's original homeland.

We may, however, be dealing with orientation toward the planet Venus at sunset:[40] the important part played by the Morning and the Evening Star or Venus (called 'Aṯtar) in the religion of pre-Islamic Arabia is well recognized.

On the Arabian mainland opposite Bahrein the writer discovered in 1940, near Dhahran and Ain as Saih, great fields of tumuli of the same two types as those on the island.[41] Political factors prevented regular excavation; but fortunately it was found possible to open two of the rock

35. Cf. RSO 9 p. 295.

36. In the opinion of Dr. Ann Perkins (written communication).

37. By Albright's chronology.

38. See BASOR 103 p. 7, fig. 3. At Tell Brak, in the Khabur drainage, a similar spatula occurs in the Third Dynasty of Ur level. Dr. Perkins considers that my spatula could, however, belong well back in the third millennium.

39. Op. cit., p. 27.

40. The extremes in the orientation of tomb doorways cleared by the present writer are W 40° S and W 5° N with W 20° S to W 26° S being most frequent. At Bahrein the limiting azimuths of the setting sun are nearly W 26° N and W 26° S; and according to calculations made at Lick Observatory, University of California, Venus — as Evening Star — would be about W 47° S at sunset in the winter solstice, while at summer solstice it would approximate W 6° N at sunset. Therefore, the range in azimuth of the grave corridors corresponds fairly well with that of the azimuth of Venus at sunset, at times of maximum brightness of the planet.

41. Cf. Cornwall "Ancient Arabia: Explorations in Hasa, 1940–41" Geogr. Journ. 107 (1946) pp. 36f.

tumuli,[42] as well as to enter a number of others which the elements or roadbuilding activities had damaged. In orientation and other internal arrangements[43] these mounds were found to parallel the rock tumuli on the island, and the writer has no doubt that the earth mounds near Ain as Saih will — when conditions permit their excavation — prove similar to the Bronze Age earth mounds of Bahrein[44].

It has been shown, then, that the "earth mounds" of Bahrein are too early to be attributable to (for example) the Aḫlamû, that they can safely be called Dilmunite tombs, and that most of them must already have been in existence at the time when Ni. 615 and 641 were written.

The modest rocks mounds of Bahrein and Hasa remain somewhat enigmatic. They may be no more than a "poor man's version" of the more elaborate earth mounds, and as such some may, of course, have been built by Aḫlamû. Rock tumuli of rather similar style have been reported from many sections of Arabia, especially the Southwest, and it is certainly evident that the building of such tombs was a custom widespread among early Arabian peoples.

Although no Bahrein tumulus yet opened has contained any inscribed object, a black basalt stone, found on that island in 1879, bears the following inscription:[45] *é-gal ri-mu-um eri* ^{d}*in-za-ak* LÚ *a-ga-rum* "Palace (of) Rimum, servant of (the god) Inzak, man (of the tribe of) Agarum".[46] The lapidary script is archaistic Old Babylonian with forms (the LÚ in particular) indicating a date somewhere in the second half of the second millennium B.C.

The inscription allows us to draw some significant inferences. Rimum to all appearances is a Semitic name, and the man of this name describes himself as member of a tribe Agarum.[47] Nevertheless he also calls himself a worshipper of the Sumerian deity Enzag.

The archaeological testimony, accordingly, does not conflict with what is revealed by the Nippur letters and other cuneiform texts, but rather tends to confirm and to supplement it. Dilmun appears as a land with a population of Semites still not very far removed from the life of the Arabian deserts,[48] but who also were affected by Sumero-Babylonian religious ideas and material culture.

Enzag, mentioned in the greeting formula of both Nippur letters,[49] occurs in *Šurpu* VIII 20, and is explained in a syllabary as the name under which Nabû was worshipped in Dilmun.[50] He is identical with the ^{d}*en-za$_6$-ag* of lines 268 and 277 of the Sumerian "Paradise" myth, "Enki and Ninḫursag.[51] This name for Nabû may also have been used, at the time of Esarhaddon,[52] in the heavily Aramean city of Der.

Meskilak (read thus for ^{d}MES-*ki*-MES) is presumably both a female deity and Enzag's consort. As Kramer has very helpfully pointed

42. Cf. BASOR 103 p. 10. In these previously untouched mounds nothing was found except a piece of crude reddish pottery and a bone awl or needle.

43. The unfortunate and misleading suggestion has been made (by R. Bowen "The Early Arabian Necropolis of Ain Jawan," BASOR SS 7–9, p. 46) that "the large majority of the so-called rock mounds around Dhahran are identical in style to the covered slit-cists of Ain Jawan." But none of the mainland rock tumuli which I entered had a slit cist nor does it seem likely that such occur in that vicinity. Moreover, the slit cists of Ain Jawan (about 30 miles NNE of Dhahran) seem from their construction, haphazard orientation, and the discovery in one of an iron finger ring, to be almost certainly later in time and altogether unconnected with the vast tumuli fields near Dhahran and Ain as Saih.

44. But the presence of a few intrusive mounds of later date, as on the island, is almost to be expected.

45. Given in JRAS 12 (1880) pp. 189ff., repeated R. Vorg. 13 pl. 58A.

46. *Agarum* is not improbably echoed in *Hagar* (*Hadjar*), the name by which Hasa province, its principal city, and also Bahrein Island were known during mediaeval times (cf. Rawlinson, loc. cit. pp. 222ff.; Encl. of Islam, s.v. "Hadjar"; Meissner OLZ 20 (1917) p. 202). Moreover, Eratosthenes (quoted by Strabo XVI 4:2) seemingly locates the *Agraei* near the Persian Gulf, and a tribe of nomads called the Banū Hagar still dwells in Hasa. In South Arabic and Ethiopic *hagar* meant "town", and Prof. Albright has pointed out to me that it is still used in the Beihân area of ancient Qatabân in the sense "mound of an ancient town."

47. We know for certain the name of only one king of Dilmun: Uperi. He is mentioned frequently in the annals of Sargon of Assyria, cf. e.g. ARAB II 41, 43, 81, 92.

48. For example, jagged-edged cups (sometimes painted) made from ostrich eggs have been found in Bahrein chambered mounds, cf. Mackay, op. cit., pp. 21, 23.

49. In Ni. 615 written ^{d}*in-zag$_x$*; in 641, ^{d}*in-za-ag*.

50. Cf. CT XXV 35 obv. 20. And Enzag appears as a form of Nusku in RA XX 98 iii, 36.

51. Cf. Kramer "Enki and Ninḫursag", pp. 20f., 30.

52. Cf. Luckenbill ARAB II 674; Meissner BA 3 (1898) p. 239.

out to me, the name is probably to be analyzed as follows: *(nin-)me-sikil-ak*, "the lady of the pure *me* (= divine ordinances[53])." For the omission of *nin* at the beginning of the word, a parallel is provided by the well known case of *(nin-)šušin-ak*. *Mes-ki-lak*, therefore, would be phonetic writing for *me-s(i)kil-ak*, the "goddess of pure decrees", which would fit in with indications that Dilmun was known as *kur-me-sikil-ak*, the "land of pure decrees".[54]

In *Šurpu* VIII 20, ^{d}*Mes-ki-lak* (thus to be read) follows immediately after ^{d}*En-zag*.[55] But another text gives Laḫamun as the name of the Ṣarpānīt of Dilmun.[56]

In Ni. 615, obv. 20, Ilī-ippašra mentions a temple, the house of *Ni[n . . . . . .]*. Regrettably, the state of the tablet prevents our reading more of this name, but in view of what we know about deities connected with Dilmun a goddess is very probably referred to; one might expect Ninḫursag.

A fragment found at Ashur gives é-karra ("House on the Quay") as the name of a temple in Dilmun[57], and in a liturgical hymn to Sin appears a reference to "the temple Šagnamsar which is in the Mount of Dilmun".[58]

It should be observed that the temple of Ni. 615 is described by Ilī-ippašra as "old", an adjective which under the circumstances obviously could imply great antiquity. But there is nothing astonishing in this; the sacred character borne by Dilmun in Sumerian religious traditions is now well recognized, and it is likely that Sumerian divinities were worshipped in Dilmun from the time — almost certainly very early — when Sumerians first reached that corner of the Persian Gulf. Moreover, study of our sources suggests that the apparatus of this worship was kept in being by a colony of officials and traders, while the comparatively primitive Semitic tribesmen forming the bulk of the population accepted this religion.

Assyriologists have found it rather difficult to understand why a small and mostly barren island, hugging the Arabian coastline, should have occupied such an important role in Sumerian mythology. Yet in the ancient world islands often enjoyed a sacred character; and it is noteworthy that Delos, the smallest of the Cyclades, was considered to have been the birthplace of Apollo and Artemis, and that it became forever sacred to these twin deities.

The dark, brooding mass of Jabal Dukhan, as well as the extraordinary freshwater springs,[59] must have given Bahrein a distinctly uncanny appearance to men of antiquity. If the Sumerians first came into contact with it through exploratory voyages from Mesopotamia, tales of this strange island could have made a strong impression on the minds of Sumerian scribes.

Nor should one overlook the possibility that the Sumerians, migrating by way of the Persian Gulf, encountered Bahrein *before* they reached Mesopotamia. If so, the island would not unnaturally have become associated in legend with divine births and "the beginning of things."[60]

53. Cf. Kramer JCS 2 pp. 39ff.

54. See Kramer BASOR 96 p. 21, n. 17. There is, however, also the possibility that *Meskilak* developed from *Ninsikilla*. Since S^{a} gives the value *min* for *nin*, if ^{d}*Nin-sikil-la* should represent ^{d}*Min-sikil-la*, and if the final *a* might be taken to stand for a Sumerian genitive, ^{d}*Minsikilak* could presumably turn into *Miskilak*. A difficulty is that the name ^{d}*Nin-sikil-la* in the Enki-Ninḫursag myth is not treated as ending in a genitive.

55. And *Miš-k[i-la-a]k* may occur in RA XX 98 iii, 42.

56. Cf. CT XXV 35 obv. 12. Some connection seems likely between Laḫamun and the goddess Laḫamu of the creation epic.

57. Cf. KAV 84, obv. 7.

58. Cf. Langdon PBS X 4 p. 279.

59. These springs, whose water actually comes underground from the Tuwaiq hills in Arabia, were doubtless considered as remarkable in ancient times as we know them to have been in later days. Cf. ASKT p. 127 for Inanna bathing her head in a fountain of Mount Dilmun.

60. In the myth "Enki and Ninḫursag", line 63 reads: *dilmun^{ki} è-gú-(kar-ra-kalam-ma-ka na-nam)* "Dilmun, (verily it is become) the house of the banks(?) and quays(?) of 'the land' ". The meaning is obscure —very unfortunately, for the phrase may conceal the explanation we seek. In addition, see Witzel, "Der Enki-Kult auf Dilmun", TZS 1932, who concludes: "Es sieht fast so aus, als ob das Kultzentrum Dilmun in der sumerischen Tradition älter sei als Eridu, als ob der Enki-Kult von Dilmun nach Eridu gewandert sei."

Appendix

THE TEXTS Ni 615 AND Ni 641 OF THE ISTANBUL MUSEUM

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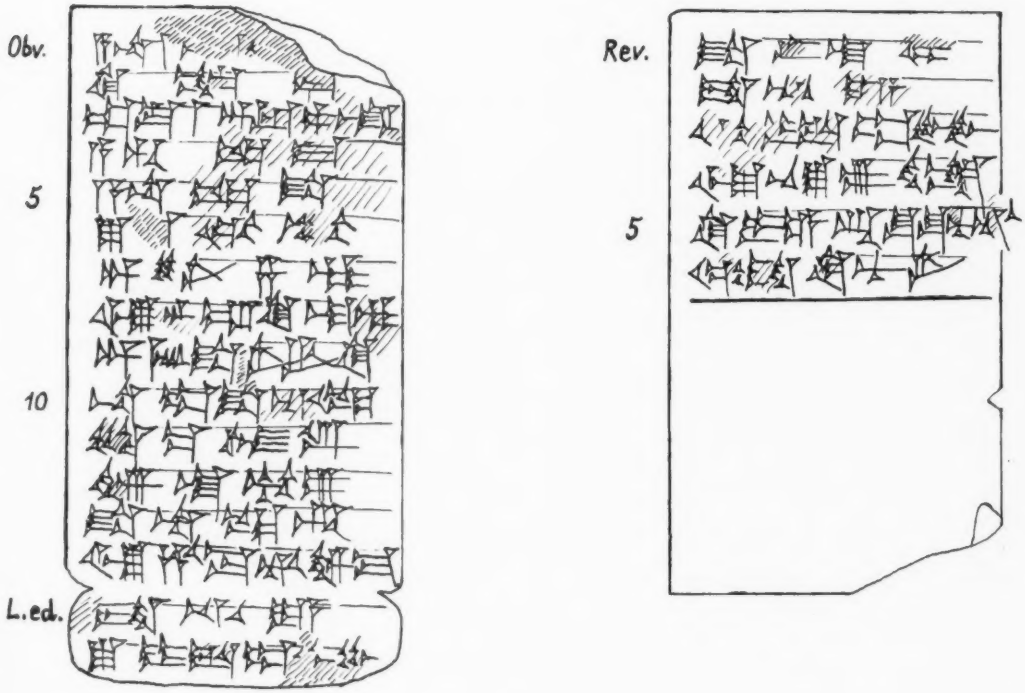
The two texts in question were submitted to me by Dr. P. B. Cornwall for translation and

Ni. 615

Ni. 641



comment. Besides a number of photos, also excellent copies by F. R. Kraus — reproduced here on p. 143 — were placed at my disposal for the purpose. Here are the results of my endeavors.

Ni. 615

Transliteration

obv. 1 [*a-na I-l*]*i-li-ia* [*qí-b*]*í-ma*
2 [*um-ma*] *ʾIlī-ip-pa-aš-ra aḫu-k*[*a-ma*]
3 [*a-na*] *ka-ša lu šu-ul-mu*
4 ^{d}*In-zag*$_{x}$ *ù* ^{d}*Mes-ki-la-a*[*k*]
5 *ilū*^{meš} *ša Tilmun*^{ki}
6 *na-ap-ša-ti-ka li-iṣ-ṣ*[*u-ru*]
7 [*ʾIl*]*-ta-nu ša il-la-k*[*a a-ta-*]*mar*
8 *ù* [*Su*]*-te-tu it-*[*t*]*a-ba-*[*al-kat-m*]*a*
9 *il-la-ka a-la-ka ša* [. . . . .].
10 [*a*]*n-ni-ti ul qí-pa-ku i-na-an-na*
11 [*a-na B*]*ābili ul-te-te-ši-ra-*[*š*]*i*?
12 [*la-m*]*a waraḫ Elūli e-te-bí*[*-i*]*r*
13 [*i-*]*ka-ša-ad-ma la-mu-ú-a-a*
14 [K]A.LUM *Aḫ-la-mu-ú it-tab-lu*
15 *ù it-tu-ú-a-a mi-im-ma*
16 [*ša*] *e-pe-ši-ia ia-nu*
17 *ù ālu*^{ki} *1-en e* SU.SU-x[.]
18 *i-na li-it āli*^{ki} *ša ú*[-. . . . . .]
19 *i-na* ^{d}*Sin-nu-ri ki-i*[. . . . . .]
20 *ù bīt ili ša eš-*[. . . . . .]
21 *bīt* [x] ^{d}*Ni*[*n-* . . . . . .]
22 *ù* [*bīt*]*u la-bí*[*-ir-ma i-na-aḫ*]
23 *i-na-an-na mi-i*[*m-ma ul*]
rev. 1 *ki-in-tum i-te?-pu*[*-uš aḫ-šu*]
2 *na-di ù ul-tu u*$_{4}$*?*[*-mi an-ni*]
3 *šu-na-ti i-ta-nam-m*[*a-ru*]
4 *ù qa-tu-tu ša eka*[*lli*]
5 *a-na 5-ši-šu i-te-la*[*-am*]
6 *i-na-an-na šum-ma i-na* x[. . . . . .]
7 *mi-im-ma a-na pa-ni-ia*
8 *ip-ta-ri-ik mi-na-a ep-pu*[*-uš*]
9 *a-na šarri iš-ša-pa-ar*
10 *at-ta a-na* [. . . . .] *qí-bi-ma*
11 *a-na ʾNawir-*^{d}*Uraš* [*l*]*i-li-ik-*[*ma*]
12 *bīta ša-šu li-iṣ-bat-ma li-ik-ši*[*-ir*]
13 *ù šum-ma a-na ʾIddin-*^{d}*Nerīgal*
14 *li-iš-pu-ru-nim-ma ālū*$^{ki-meš}$
15 *ša a-lik ur-ki-ti i-na pa-ni*
16 *ša-šu-ḫi i-ba-šu-ú*
17 [*bīt*]*a ša-šu li-iṣ-ba-tu*
18 [*li-*]*ik-ši-ru*
19 [. . . . .]. *ki pa-la-ḫi*
20 [. . . . .] *ul aq-bi*

Translation

[1] [To Il]iliya speak! [2] This is what Ilī-ippašra, thy brother, said: [3] [Unto] thee be well-being! [4] May Inzag and Meskilak, [5] the gods of Tilmun, [6] guard thy life!

[7] Iltānu who will arrive [I have m]et. [8] Also [the Sutean woman(?)] has crossed (the sea) and [9] [she] will arrive. Of the coming of this [Sutean woman(?)] I am not (so) sure. Now [11] I have directed her to Bābil. [12] [Before] the month of Elūlu draws to a close [she] will reach (there). [14] Around me the Aḫlamû have carried away the dates, [15] thus with me there is nothing that I can do. [17] But a single town must not be allowed to remain pillaged(??).

[18] In the town which I [. . . . .], when from Sīn-nurī [I heard] — [20] and the temple I h[eard about] [21] (is) the house of Ni[n. . . . .] — [22] the house was ol[d and had collapsed]. [23] Now he has done [no]thi[ng] at all(??), he [let it] go. And from that day on [3] they keep seeing dreams [4] and the destruction of the palace [5] has been indicated for a fifth time. [6] If now in ..[. . . .] something he has prevented me from achieving, what could I do? [9] Should he be sent to the king? [10] Speak you to [. . . . .], [11] so that he may go to Nawir-Uraš. [12] May he get to work and repair that house. Or may they write to Iddin-Nerīgal — towns [14] of (his) retainers exist near . . . . . — [17] and may they get to work and repair that house.

[19] [I have spoken] respectfully; [in a way that might offend you], I did not speak.

Commentary

obv. 1: Reading according to F. R. Kraus.

obv. 4: Misread *Šid-di-la-ak* by Unger, Reall. d. Vorg. 13 (1929) 313. It seems that, because of Ni. 641, for the sign 'sag' a value *zag* is to be posited. This variant and the one to be found in Šurpu VIII 20 make it certain that the spelling of the name is phonetic.

obv. 7: Reading according to F. R. Kraus. — Restoration of the last word is uncertain.

obv. 8: *Su-te-tu*(?). This is more likely a gentilic than a proper name, at least if at the end of line 9 the same

[*Su-te-t*]*i*? is to be restored. *Sutētu* may stand for *Sutītu* and denote "Sutean woman".

obv. 10: Meaning uncertain.

obv. 13: *la-mu-ú-a-a* is not known to me from other passages, but the construction is good Cassite and like *it-tu-ú-a-a* in line 15.

obv. 14: [K]A.LUM, i.e. *suluppī*.

obv. 17: *e* should be negation; it is normal in negative wishes. The verbal form that should follow is apparently written ideographically and may be meant to be read as a stative. SU.SU is *šallu* "despoiled" according to Meissner, SAI 94; cf. Delitzsch, Sumerisches Glossar 249 s.v. sud.

obv. 18: Restore either "I am living in" or "I am responsible for"??

obv. 20–21: For these lines a collation of S. N. Kramer was also available; it confirmed Kraus' readings throughout.

obv. 20: The restoration *ša eš*[-*mu-ú*] is, to judge from the preserved traces, likely.

rev. 1: The meaning given for *kintum* is merely a guess and may be wrong.

rev. 5: Literally: "has come up, emerged".

rev. 8: Literally: "has blocked".

rev. 16: *ša-šu-ḫi* (or *ša šu-ḫi*) remains obscure to me.

Ni. 641

	Transliteration	Translation
obv. 1	*a-na* ^{I}*Il-l*[*i-ia*]	To Ill[iya]
	qí-bí-ma	speak!
	um-ma ^{I}*Ilī-ip-pa-aš-ra*	This is what Ilī-ippašra,
	a-ḫu-ka-ma	thy brother, said:
5	*a-na ka-ša*	Unto thee
	lu [*š*]*u-ul-mu*	be well-being!
	^{d}*In-za-ag*	May Inzag
	ù ^{d}*Mes-ki-la-ak*	and Meskilak,
	ilū^{meš} *ša Tilmun*^{ki}	the deities of Tilmun,
10	*na-ap-ša-ti-ka*	guard
	li-iš-ṣu-ru	thy life!
	Aḫ-la-mu-ú	The Aḫlamû
	ša na-ka-ri	certainly talk
	ù ḫa-ba-ti-im-ma	to me
lo.e.	*it-ti-ia*	only of violence
	lu i-da-ab-[*b*]*u-bu*	and plunder;
rev. 1	*ša sa-la-mi*	of conciliation
	it-ti-ia	they do not talk
	ul i-da-ab-bu-bu	with me.
	ù be-lu ú-ḫi-bil	The lord put it upon me
	ki-i e-ri-šu-šu-nu-ti	to ask them,
	ul id-di-nu-ni	but they did not comply.

Commentary

obv. 8: This seems to be the reading that is paleographically most probably. Cf. Šurpu VIII 20 (H. Zimmern, Beiträge zur Kenntnis der babylonischen Religion, p. 42f.) "^{d}*En-zag* ^{d}*Mis-ki-mis*" in a list of deities that have to do with water.

rev. 4: A collation by S. N. Kramer confirms Kraus' copy.

A LATE BABYLONIAN STAR CATALOG

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The pitiful remains of the right-hand column of BM 46083[1] are adequate to indicate that they are part of a star catalog, the first example of its kind which has come to light. The stars which are contained in this catalog belong to a very particular group of stars scattered about the ecliptical belt. In the modern literature, ever since Epping, these stars have been called Normal Stars.[2]

The relevant lines of the right-hand column, such as they are, read:

1′ gi[š]-kun .....[ ] 20(?) a(?)
2′ gìr *ár-tú šá* múl-a 30(?) . 1 absin
3′ *šur-ši* absin 16 s[a$_4$] *šá*(?) absin(?) 28(?) [absin(?)]
4′ múl-rín *šá* tu$_{15}$-1 20 rín
5′ múl-rín *šá* tu$_{15}$-2 25 rín
6′ múl *e* .....[ ]

1′ "The Loin(??) [of the Lion]: 20(?) Leo(?).
2′ The Rear Foot of the Lion: 30(?) (Leo? or?) 1 Virgo.
3′ The Root of the Barley-Stalk(?)[3]: 16 (Virgo). The Bright (Star) of the Barley-Stalk(?)[3]: 28(?) (Virgo).
4′ The Southern Balance-Pan: 20 Libra.
5′ The Northern Balance-Pan: 25 Libra.
6′ The Upper (Star) ....."

Since the text is not without its difficulties, it is best to start with the lines which can be interpreted with certainty. Lines **4** and **5** show at once that the spelling of the star names does not conform to the more or less standard terminology of the Normal Stars found in Seleucid astronomical texts from Babylon. The names for α librae and β librae appear in our text in the otherwise unattested forms

múl-rín *šá* tu$_{15}$-1
múl-rín *šá* tu$_{15}$-2,

respectively, the Seleucid terms being

rín *šá* gàl
rín *šá* si.

The use of tu$_{15}$-1 and tu$_{15}$-2 for "south" and "north" is well known otherwise in Late Babylonian usage,[4] according to which the directions

1. Older inventory number: SH 81-7-6, 531. Only one side is preserved. Though the tablet was acquired by purchase, it is virtually certain that its provenience is Babylon. I became acquainted with this text through a partial copy, made in 1891, by J. N. Strassmaier, which was very kindly placed at my disposal by Professor J. Schaumberger. It is published here, by courtesy of the Trustees of the British Museum, from a photograph.

2. The latest list is in Kugler, SSB 2, pp. 550f. Older literature: Epping, ZA 7 (1892) 224f. and Kugler, SSB 1, p. 29.

3. For this meaning, not "furrow", of absin here, cf. Thureau-Dangin, Textes math. bab., p. 36, note 2.

4. Cf., e.g., Jastrow, ZA 23 (1909), p. 197, note 1. Thureau-Dangin, Rituels accadiens, p. 136, note 2. Cf. also Bezold, Catalogue . . . II (1889), p. 430, second footnote.

numbered 1 through 4 correspond to South, North, East, and West, respectively.

In the first half of line **3**, the name *šur-ši* absin for γ virginis appears in precisely the same spelling as in Seleucid terminology.

In line **2**, our text uses for β virginis gìr *ár-tú šá* múl-a in contrast to the still more abbreviated Seleucid gìr *ár šá* a. In Late Babylonian astronomical texts, the abbreviation *ár* for *arkū* and *arkītu* — not to mention *arki* — is commonplace. The identical mating of the abbreviation *ár*, treated functionally as if it were an ideogram, and the phonetic complement *-tú* to indicate the word *arkītu* is also attested in Seleucid astronomical texts.[5]

We cannot add much more to this stockpile of assured identifications by the mere continuation of the lexicographical approach. We must now pass over to the exploitation of the additional information supplied by our catalog: the longitudes of the Normal Stars. Above is a list of those Normal Stars which we need for our discussion. Their longitudes at −500 and 0 are given,[6] and the last column lists the name of each of these Normal Stars as it is generally written in Seleucid astronomical tablets from Babylon. To facilitate our present discussion, I list below the differences in longitude between these same Normal Stars because, unlike the longitudes themselves, the differences remain unchanged with time.

When comparing with these accurate values the Babylonian longitudinal differences of our text, we are of course in a slightly disadvantageous position because our text always expresses the number of degrees within a zodiacal sign as an integer. For example, the difference in longitude between α librae and β librae is 5° according to the information in lines 4–5 of our text; computation shows only 4.3°. An indication of the fact that such rounding-offs did not, however, give rise to the serious accumulation of errors is the longitudinal difference, according to the text, between γ virginis (line 3) and β librae (line 5) amounting to 39°; this is in quite good agreement with the accurate difference, 38.9°.

The reading of the longitude for β virginis at the end of line **2** presents a problem. The last

NORMAL STAR	LONGITUDE AT −500	LONGITUDE AT 0	STANDARD NAME
θ leonis	128.7° = Leo 8.7°	135.6° = Leo 15.6°	giš-kun ur-a
β leonis	137.1 = Leo 17.1	144.0 = Leo 24.0	giš-kun a
β virginis	141.9 = Leo 21.9	148.9 = Leo 28.9	gìr ár šá a
γ virginis	155.8 = Virgo 5.8	162.6 = Virgo 12.6	šur-ši absin
α virginis	169.1 = Virgo 19.1	176.0 = Virgo 26.0	sa_4 šá absin
α librae	190.4 = Libra 10.4	197.3 = Libra 17.3	rín šá gàl
β librae	194.7 = Libra 14.7	201.6 = Libra 21.6	rín šá si
δ scorpii	207.9 = Libra 27.9	214.8 = Scorpius 4.8	múl múrub šá sag gír-tab
β scorpii	208.5 = Libra 28.5	215.4 = Scorpius 5.4	múl e šá sag gír-tab

5. For some occurrences of *ár* and *ár-tú*, consult Kugler, SSB 1, p. 268, under *ĀR*.

6. Computed by Karl Schoch, Planeten-Tafeln für Jedermann . . . (Linser-Verlag, Berlin-Pankow, 1927), p. 13. These longitudes are normed according to the definition: 0° = Aries 0° = vernal point.

two signs are clearly 1 absin. The preceding sign is equally clear: the usual interpretation of this sign in the last several centuries before our era is "9", but there are a few passages[7] in which it is used as a separation sign or "zero" (which I transcribe as "."). The interpretation of the sign as "9" seems to make no sense whatsoever here. The sign preceding it seems to be "30", but "29" (so read by Strassmaier) is not completely excluded. All in all, then, it is not clear whether the longitude expressed by the text is meant to be "0 (or) 1 Virgo" or "29 (Leo or) 0 (or) 1 Virgo." Whatever the correct reading may be, the accurate difference between the longitude of the first two signs, giš-kun, is preserved to indicate that the Normal Star is, as expected, either β leonis or θ leonis. The traces of the longitude at the end of the line are baffling. One might expect something in the neighborhood of Leo 28 if β leonis is involved, or about 10° less if θ leonis. The text seems to read 20 a, pointing to θ leonis but leaving us completely mystified as to why β leonis should have been omitted.

In line **6**, we should expect δ scorpii or β scorpii. The first two signs, múl *e*, definitely favor β scorpii, but the following sign, which looks like a KI, makes it difficult to read the name of the Normal Star in either of its two otherwise attested

	β leonis	β virginis	γ virginis	α virginis	α librae	β librae	δ scorpii	β scorpii
θ leonis	8.4	13.2	27.1	40.4	61.7	66.0	79.2	79.8
β leonis		4.8	18.7	32.0	53.3	57.6	70.8	71.4
β virginis			13.9	27.2	48.5	52.8	66.0	66.6
γ virginis				13.3	34.6	38.9	52.1	52.7
α virginis					21.3	25.6	38.8	39.4
α librae						4.3	17.5	18.1
β librae							13.2	13.8
δ scorpii								0.6

of β virginis and, e.g., the longitudes given in the text for γ virginis and β librae should have led to a longitude "2 Virgo" for β virginis.

As is evident from the list of Normal Stars, the traces at the end of line **3** must be interpreted as the remains of the name of α virginis: sa_4 *šá* absin. As for its longitude, the two corner-wedges of the "20" are certain; they are followed by the traces of what is probably an "8" ("9" is excluded). From the longitudinal differences between α virginis on the one hand and γ virginis or α librae on the other, one would expect "29 Virgo."

The interpretation of line **1** is difficult. Enough forms: múl *e šá* sag gír-tab or múl *e šá* sag-k gír-tab.[8]

After a break of 6 to 8 lines, there are traces at the beginnings of two lines. I have not been able to correlate these traces with names of Normal Stars that might be expected in these positions, and it may well be that the subject matter is no longer the catalog.

The remains of the left-hand column of our text, though the subject matter is extremely obscure, have nothing to do with the catalog of Normal Stars contained in the right-hand column. The end of the first preserved line is illegible. The

7. MM 86.11.410 (MCT p. 15); BM 34081 + ... (a planetary procedure text which will be published by O. Neugebauer) rev. III 6 (five times!), 7.

8. For the second form, which is rare, cf. the quotation from Sp. 192 in Kugler, SSB 1, Taf. XXIV, under KI. An interpretation sag-ki seems to me superior to sag ki.

next three lines end with gu_4-ud, "Mercury"; *ár*(?) *dili-pát*, "behind(?) Venus"; *u šamáš*, "and the sun". In the next line, I cannot interpret the first half of the line, but the second half reads *ár* genna *šil-taḫ* gu_4-ud. These words, taken individually, probably mean "behind", "Saturn", "arrow", and "Mercury", but, the larger context being unknown, I have not succeeded in combining them to make sense. The next line begins to be legible not far from the left-hand margin; it reads:] 5(?)-ta-àm igi-meš *u ár*-meš gu_4-ud. This may mean something like "[. . . . .] 5(?) each, those in front and those behind: Mercury". Of the remaining lines, only the ends are legible or preserved: *dili*(?)-*pát*(?) *ár* genna, "Venus(?) behind Saturn"; *šamáš*, "the sun"; an, "Mars"; gu_4-ud, "Mercury"; múl-babbar, "Jupiter"; *dili*(?)-*pát*, "Venus". Though it seems evident that the subject matter is astrological, I have nothing but the vaguest idea of what is actually said in the left-hand column, or why it is associated with the catalogue of Normal Stars in the neighboring column.

The use of Normal Stars is restricted to certain types of astronomical texts. They are never referred to in the mathematical astronomical texts of the Seleucid period, in which longitudes are always expressed as some number of degrees inside one of the twelve signs of the zodiac. Of the various categories of non-mathematical astronomical texts of the Seleucid period — Almanacs, N. S. Almanacs, Goal-Year Texts, and Diaries[9] — only the Almanacs never mention the Normal Stars. In the N. S. Almanacs and the Goal-Year Texts, whenever a planet passes a Normal Star, the date and the planet's distance above or below the Normal Star are recorded. The Diaries, in addition, record more or less the same information for the moon as well. In all these non-mathematical astronomical documents, a sign of the zodiac, on the other hand, is mentioned only in connection with (1) a few characteristic phenomena (such as first appearance, last appearance, etc.), or, in some of the categories, (2) the entrance of a planet into a zodiacal sign or its presence there at the beginning of a month.

If we inspect the few available astronomical records from the three centuries preceding the Seleucid Era, the only one of the above-mentioned major categories that we find attested is the Diaries. These early Diaries are exceedingly rare, and, of these, the oldest which still seems to mention zodiacal signs is dated to the year −418/417.[10] Our earliest Diary (or perhaps it should be called a Proto-Diary) dates to the year −567/566.[11] Common to all Diaries is the use of Normal Stars. It seems quite possible that the continued recording of observations of positions with respect to Normal Stars long after the invention of the zodiac may be due in part to force of habit, in part to the higher degree of accuracy of observation possible when one uses Normal Stars. Be that as it may, it seems quite clear that the potentialities inherent in the invention of the zodiac could not have been realized unless one could convert the longitude of a Normal Star to an expression involving a certain number of degrees inside a zodiacal sign. This may be the raison d'être of our catalog of Normal Stars.

In this connection, a few words must be said about the thorny problem of the norming of the zodiac. Much has been written about this problem, but — with all due respect to the display of tremendous industry and astounding ingenuity on the part of various scholars — little is known or convincingly proved. The two latest discussions, which contain references to the older literature, are by B. L. van der Waerden[12] and O. Neugebauer.[13] The latter, whose main purpose was to show that there is no evidence in Babylonian astronomical texts for a conscious recognition of the fact of precession, assumed a position of cautious agnosticism. Van der Waerden used the fact that certain texts seem to indicate that the mean difference in longitude between the Babylonian values and those computed with the aid of modern tables was about $3\frac{1}{2}$ degrees for the period between 100–150 Seleucid Era, about $4\frac{1}{6}$ degrees between 150–180 S.E., and about $5\frac{1}{3}$ degrees between 200–250 S.E. As an explanation for this, he suggested that the Babylonian as-

9. For the technical meaning of these terms, see JCS 2 (1948), pp. 277ff. and the literature cited there.

10. VAT 4924 (unpublished), last mentioned in A. Rehm, Parapegmastudien (= Abh. d. Bay. Ak., Phil.-hist. Abt., N.F. 19 (1941)), pp. 22f.

11. P. V. Neugebauer and E. F. Weidner, "Ein astron. Beobachtungstext aus dem 37. Jahre Nebukadnezars II. (−567/66)" (= Ber. über d. Verh. d. Königl. Sächs. Ges. d. Wiss. z. Leipzig, Philol.-hist. Kl., Bd. 67, Heft 2).

12. Eudemus, Vol. I (1941), pp. 46f.

13. JAOS 70 (1950), pp. 1–8.

tronomers first used as their norming fixed-star ν piscium for Aries 0°, discarded it for the brighter star ξ tauri to define Taurus 30°, and finally shifted to α virginis to fix Virgo 30° in the zodiac. The proposed change of norming star twice in a century or so strikes me, I must confess, as rather implausible. Speaking generally, the testing and evaluation of any such hypothesis will have to be preceded by two gigantic tasks that have not been completed: the systematic analysis of all the available mathematical astronomical texts as well as the non-mathematical astronomical texts to reach a fuller realization of all the implications for our problem. Until we gain this deepest possible insight into these two bodies of source material, it seems unlikely that we will have adequate grounds for evaluating the hidden errors due to various causes: those which accumulate because they are inherent in the systems of prediction, those due to the inaccuracy of the initial observations, those due to unnoticed errors that had previously been made, etc.

In all discussions of the problem our present catalog of Normal Stars must henceforth be taken into account. Despite its grossness in rounding-off to integer degrees and its other inaccuracies of as much as 1° or 2°, it is nonetheless a real catalog that was considered valid at some particular moment.

In view of its use of the zodiac, the date of the catalog must fall somewhere in the latter part of the Persian period or in Seleucid-Arsacid times. Paleography is not sufficient (at least, for me) to distinguish between an Achaemenidan and a Seleucid date. The unusualness of some of the terminology, on the other hand, leaves me with the definite impression that the date of composition lies before the beginning of the Seleucid Era.

BABYLONIAN MATHEMATICAL TEXTS II-III*

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II. Approximations of Reciprocals of Irregular Numbers in an Old-Babylonian Text

In Babylonian mathematics, the division of a number a by a number b is carried out by finding the sexagesimal value of $\frac{1}{b}$ (or, as I shall write henceforth, $\bar{b}$) and then multiplying it by a. Finding the sexagesimal values of reciprocals, consequently, was a subject which had to be considered at a still elementary level of mathematical training.

Two types of numbers, called "regular" and "irregular" in the modern literature, are involved. A regular number is one which contains no prime factors except 2 and 3 and 5, and the reciprocal of which therefore can be written in a finite sexagesimal form. Thus, 30 and 4 are regular numbers and $\overline{30} = 0;2$ and $\overline{4} = 0;15$. An irregular number, on the other hand, contains a prime factor other than 2 and 3 and 5; and its reciprocal consequently cannot be expressed in a definite number of sexagesimal places. An example of an irregular number is 21, its reciprocal being 0;2,51,25,42,51,25,42,. . . . . , where the dots represent the periodic repetition of 51,25,42.

In Old-Babylonian mathematics, knowledge of a standard table of some thirty pairs of reciprocals of regular numbers was assumed.[1] Knowing this table meant knowing the reciprocals of 25 one-place numbers (such as 12 or 32), 14 two-place ones (example: 56,15), and 4 which are three-place (e.g., 1,6,40). This information was usually sufficient to carry out divisions in actual mathematical problems. An indication that one could proceed surprisingly far with so small a body of pairs of reciprocals is the fact that in the vast majority of divisions encountered in the extant Old-Babylonian texts containing the solutions to mathematical problems, one of these 43 numbers of the standard table appears as the divisor.

To find the sexagesimal values of regular numbers which are *not* in the standard table of reciprocals, a tedious but correct technique[2] was developed, assuming as given only a knowledge of the contents of the standard table. The reciprocals of all regular numbers, without exception, could therefore be found.

Division by irregular numbers, on the other hand, is rarely encountered in Babylonian mathematics. In the extant solutions of problems, there are fewer than 20 cases where such divisions had to be carried out.[3] It is highly significant that in none of these divisions does one use an approximation of the endless sexagesimal equivalent of the reciprocal of the irregular number involved. The answer is always a nice, simple number (like 20 or 30 or 3,20) for which, with one exception, a *multiplication* table was available in the repertoire of assumed knowledge. One could therefore easily see at once that, to mention only one instance, the division of 52,30 by 13,7;30, must lead to 4 because $4 \cdot 13 = 52$ was already known from the multiplication table for 4, and $7;30 \cdot 4 = 30$ was known from the multiplication table for 7,30. In other words, the divisions which we find had been rigged in advance in such a way that the prime factors — other than 2 and 3 and 5 — of the divisor were also contained in the dividend, resulting in their being cancelled out.

We have, then, no mathematical problem-text which presents a division by an irregular number where the dividend is a regular number (for example, 5/7) or an irregular number having irregular prime factors not contained in the divisor (for instance, 13/17). That, nevertheless, interest was displayed in reciprocals of irregular numbers purely as reciprocals is proved by two bits of direct evidence from the Old-Babylonian period

* I = JCS 1 (1947), pp. 219–240.

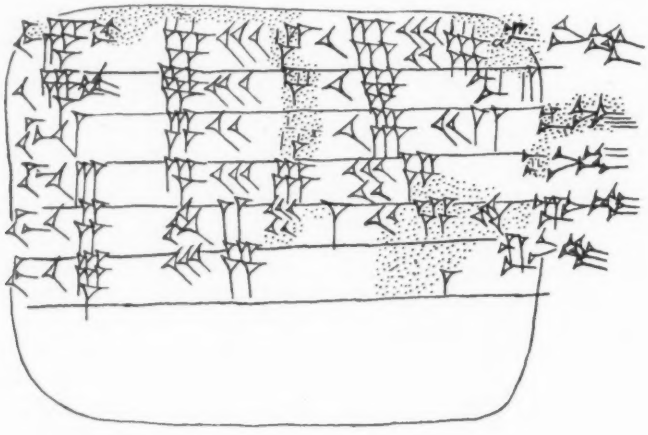
1. For details, see, e.g., Neugebauer and Sachs, MCT, pp. 11f. and the literature cited there.

2. Described in nauseous detail in JCS 1 (1947), pp. 219–240. The reader who manages to get as far as the ninth page of that article will find it useful to know that pages 228 and 229 should be interchanged.

3. They are listed in JNES 5 (1946) 212, note 24 and JCS 1 (1947) 224, note 6.

(around 1700 B.C.). The first is a fragment of a still unique table of reciprocals which originally listed the 80 regular *and* irregular integers[4] between 1 and 1,20. The preserved portion covers the numbers from 56 on, 18 of which are irregular. Approximations, to 3 or 4 sexagesimal places, are given for the reciprocals of these irregular numbers.[5]

The second piece of evidence, published herewith, is an Old-Babylonian text M10 in the John



F. Lewis Collection of Cuneiform Tablets in The Free Library of Philadelphia.[6] The maximum dimensions of its length, width, and thickness are: 80 x 62 x 25 mm. The obverse reads:

1) igi-7-bi 8,34,16,59 SI-NI-ÍB
2) i⟨gi⟩-7-bi 8,34,18 dirig
3) igi-11 5,27,16,22 SI-NI-ÍB
4) igi-13 4,36,55 SI-NI-ÍB
5) igi-14 42,51,25,40 SI-NI-ÍB
6) igi-17 35,[1]7 SI-NI-ÍB

Translation:[7]

1) The reciprocal of 7 is 8,34,16,59. Deficit.
2) The reciprocal of 7 is 8,34,18. Excess.
3) The reciprocal of 11 is 5,27,16,22. Deficit^{sic}.
4) The reciprocal of 13 is 4,36,55. Deficit.
5) The reciprocal of 14 is 42,51,25,40^{sic}. Deficit^{sic}.
6) The reciprocal of 17 is 35,17^{sic}. Deficit^{sic}.

To understand what this means and to appreciate the problems which arise, one must bear in mind the correct values of the reciprocals of the numbers in question:

$\overline{7}$ = *8,34,17,*.....
$\overline{11}$ = *5,27,16,21,49,*.....
$\overline{13}$ = *4,36,55,23,*.....
$\overline{14}$ = 4,*17,8,34,*.....
$\overline{17}$ = *3,31,45,52,56,28,14,7,*.....

where the dots indicate that the italicized part of the number must be repeated indefinitely.

Instead of 8,34,17,....., lines 1 and 2 of our text offer two different values for 7, the first 8,34,16,59, the second 8,34,18. The first is followed by the word SI-NI-ÍB, the meaning of which in administrative records of the Ur-III and Old-Babylonian periods is clearly "balance, remainder, deficit".[8] The second is followed by

4. YBC 10529, published by Neugebauer and Sachs. MCT, p. 16.

5. For a comparison of these approximations with the facts, indicating some scribal errors and rounding-offs, etc., see MCT, p. 16.

6. It is a pleasure to express here my gratitude for privileges and co-operation extended by Librarians F. H. Price and E. Greenaway, Dr. B. Weitzel of the staff of the Library, and Prof. C. H. Gordon, under whose guidance it is planned that several of his students will publish various categories of texts in this collection, which consists of more than 2800 tablets.

7. From this point on, I shall make no decision about the location of the sexagesimal semi-colon. By $\overline{4}$ = 15 I will mean $\overline{0;4}$ = 15 and $\overline{4}$ = 0;15 and $\overline{4,0}$ = 0;0,15, etc.

8. Cf., for the Ur-III data, the discussion and bibliography in A. L. Oppenheim, Catalogue of the Cuneiform Tablets of the Wilberforce Eames Babylonian Collec-

dirig, "excess", a very common term found also in mathematical texts. The first two lines, then, express the fact that the value 8,34,16,59 is too little, 8,34,18 too great; or, in other words, that the first three digits can be guaranteed to be 8,34,17. Though I do not have the slightest doubt that this interpretation is correct, I want to be the first to point out that the interpretation of SI-NI-ÍB in the sense of "deficit, remainder" (and meaning, in effect, "too little") cannot be applied in lines 3, 5, and 6 of our text unless one assumes a scribal lapse.

The value for $\bar{1}\bar{1}$ in line 3 is slightly too great, for $\bar{1}\bar{3}$ in line 4 a bit too small.

Lines 5 and 6 present values for $\bar{1}\bar{4}$ and $\bar{1}\bar{\bar{7}}$ which — if one interpret the text literally — are obviously ridiculous. Since it is just as obvious that the writer of the tablet was neither a lunatic nor a fool, it is our duty to make an effort to determine what he meant — but failed to say — here. Indeed, it turns out that the numbers in lines 5 and 6 refer, not to $\bar{1}\bar{4}$ and $\bar{1}\bar{\bar{7}}$, but to $10 \cdot \bar{1}\bar{4}$ and $10 \cdot \bar{1}\bar{\bar{7}}$. One can, with equal right, formulate this differently by saying that $n \cdot \bar{n} = 10$ instead of the usual $n \cdot \bar{n} = 1$ is required.[9] In line 5, the number

$$42,51,25,40 = 10 \cdot \bar{1}\bar{4} = 5 \cdot \bar{\bar{7}} = 5 \cdot 8,34,17,8$$

implies an even better approximation of $\bar{\bar{7}}$ than the one that we inferred from lines 1–2. From the information in line 6, which can be expressed as

$$35,17 = 10 \cdot \bar{1}\bar{\bar{7}} = 10 \cdot 3,31,42,$$

one can see that a less accurate approximation was made for $\bar{1}\bar{\bar{7}}$. Why lines 5 and 6 contain the factor 10 and why this fact is not expressed in the text are, at least for the present, unsolvable problems.

It would be interesting indeed to know how far beyond our text the Babylonian mathematicians proceeded in their investigation of the promising problem of the reciprocals of irregular numbers.

The reverse of the tablet is blank except for two or three isolated wedges which still remained visible after the scribe had erased the signs to which they had once belonged. There are also three or four illegible traces of wedges of the same type on the upper edge of the obverse. My experience leaves me with the impression that such remnants of wedges are particularly characteristic for much re-used "school" tablets. This need not mean necessarily that our tablet is the work of a mere pupil. Teachers, too, wrote tablets in the schools.[10]

III. The Problem of Finding the Cube Root of a Number

VAT 8547 is an Old-Babylonian text which, for some unknown reason, was overlooked when the mathematical texts of the Berlin Museum were made available to O. Neugebauer for inclusion in his Mathematische Keilschrift-Texte. Permission to publish this text here was kindly granted by G. R. Meyer, Director of the Vorderasiatische Abteilung.

Obverse

1) [b]a-si 27 [*mi*]-*nu*-[*um*]
2) [*a*]*l-ta i-na* 27 7,30 *ú-su*$^{\text{sic}}$-*uḫ-ma*
3) 26,52,30 *te-zi-ib* 7,30 *ša ta-as-sú*$^{\text{sic}}$-*ḫu*
4) *ša-pa-al* 26,52,30 gar-ra-ma
5) 26,52,30 7,30 ba-si 7,30 *mi-nu-um* 30
6) igi 7,30 *pu-ṭur-ma* 8
7) 8 *a-na* 26,52,30 7,30 íl 3,36
8) ba-si 3,36 *mi-nu-um* 6
9) 6 *a-na* 30 ba-si íl 3
10) 27-e 3 ba-si

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11) [ba-s]i 1,4 *mi-nu-um*
12) *al-ta i-na* 1,4 7,30 *ú-su*$^{\text{sic}}$-*uḫ-ma*
13) [1,3],52,30 *te-zi-ib* 7,30 *ša ta-as-sú*$^{\text{sic}}$-*ḫu*
14) [*ša-pa-a*]*l* 1,3,52,30 gar-ra-ma
15) [1,3],52,30 7,30 ba-si 7,30 *mi-nu-um* 30
16) [igi 7,30] *pu-ṭur-ma* 8
17) [8 *a-na*] 1,3,52,30 7,30 íl 8,32
18) [ba-si] 8,32 *mi-nu-um* 8
19) [8] *a-na* 30 ba-si íl 4
20) [1,4]-e 4 ba-si

tion. . . . (= Am. Or. Series, Vol. 32, 1948), p. 124. The term does not occur in the extant mathematical texts.

9. I expressly mention this formulation because we actually have a fragment of a "reciprocal" table (VAT 3462, published in Neugebauer, MKT I, p. 30) based on the definition $n \cdot \bar{n} = 10$.

10. The results of the present article are mentioned in O. Neugebauer, The Exact Sciences in Antiquity (Copenhagen, 1951), pp. 33f.

21) [ba]-si 2,5 *mi-nu-um*
22) *at-ta* ⟨*i-na*⟩ 2,5 7,30 *ú-su*$^{\text{KIC}}$-*uḫ-ma*
23) 2,4,52,30 *te-zi-ib* 7,30 *ša ta-sú*$^{\text{KIC}}$-*ḫu*

Reverse

1) *ša-pa-al* 2,4,[52],30 gar-ra-ma
2) 2,4,5[2,30 7],30 ba-si 7,30 *mi-nu-um* 30
3) igi 7,30 *pu-ṭur-ma* 8
4) 8 *a-na* 2,4,52,30 7,30 íl 16,40
5) ba-si 16,40 *mi-nu-um* 10
6) 10 *a-na* 30 ba-si íl 5
7) 2,5-e 5 ba-si

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8) ba-si 3,3[6 *mi-nu-u*]*m*
9) [*at-ta i-na*] 3,36 7,30 *ú-su*$^{\text{KIC}}$-*uḫ-ma*
10) 3,35,52,30 *te-zi-ib* 7,30 *ša ta-sú*$^{\text{KIC}}$-*ḫu*
11) *ša-pa-al* 3,35,52,30 gar-ra-ma
12) 3,35,52,30 7,30 ba-si 7,30 *mi-nu-um* 30
13) igi 7,30 *pu-ṭur-ma* 8
14) 8 *a-na* 3,35,52,30 7,30 íl 28,48
15) ba-si 28,48 *mi-nu-um* 12
16) 12 *a-na* 30 ba-si íl 6
17) 3,36-e 6 ba-si

(The rest of the reverse is uninscribed.)

VAT 8547

Translation

Obverse

1) [Wh]at is the cube root of 27?
2) As for you — subtract 0;7,30 from 27.
3) You will leave 26;52,30. The 0;7,30 which you subtracted
4) place below 26;52,30:
5) 26;52,30 0;7,30. What is the cube root of 0;7,30? (Answer:) 0;30.
6) Find the reciprocal of 0;7,30, (namely,) 8.
7) Multiply 8 by 26;52,30 0;7,30 (sic). (The result is) 3,36.

8) What is the cube root of 3,36? (Answer:) 6.
9) Multiply 6 by 0;30, the (above-mentioned) cube root. (The result is) 3.
10) 3 is the cube root of 27.

---

11) What is the [cube roo]t of 1,4?
12) As for you — subtract 0;7,30 from 1,4.
13) You will leave [1,3];52,30. The 0;7,30 which you subtracted
14) place [belo]w 1,3;52,30:
15) [1,3];52,30 0;7,30. What is the cube root of 0;7,30? (Answer:) 0;30.
16) Find [the reciprocal of 0;7,30], (namely,) 8.
17) Multiply [8] by 1,3;52,30 0;7,30 (sic). (The result is) 8,32.
18) What is [the cube root of] 8,32? (Answer:) 8.
19) Multiply [8] by 0;30, the (above-mentioned) cube root. (The result is) 4.
20) 4 is the cube root of [1,4].

---

21) What is the [cu]be root of 2,5?
22) As for you — subtract 0;7,30 ⟨from⟩ 2,5.
23) You will leave 2,4;52,30. The 0;7,30 which you subtracted

Reverse

1) place below 2,4;[52],30:
2) 2,4;5[2,30 0;7],30. What is the cube root of 0;7,30? (Answer:) 0;30.
3) Find the reciprocal of 0;7,30, (namely,) 8.
4) Multiply 8 by 2,4;52,30 0;7,30 (sic). (The result is) 16,40.
5) What is the cube root of 16,40? (Answer:) 10.
6) Multiply 10 by 0;30, the (above-mentioned) cube root. (The result is) 5.
7) 5 is the cube root of 2,5.

---

8) [Wha]t is the cube root of 3,36?
9) [As for you —] subtract 0;7,30 [from] 3,36.
10) You will leave 3,35;52,30. The 0;7,30 which you subtracted
11) place below 3,35;52,30:
12) 3,35;52,30 0;7,30. What is the cube root of 0;7,30? (Answer:) 0;30.
13) Find the reciprocal of 0;7,30, (namely,) 8.
14) Multiply 8 by 3,35;52,30 0;7,30 (sic). (The result is) 28,48.
15) What is the cube root of 28,48? (Answer:) 12.
16) Multiply 12 by 0;30, the (above-mentioned) cube root. (The result is) 6.
17) 6 is the cube root of 3,36.

Commentary

We have only one other mathematical text having to do with the finding of cube roots: YBC 6295, published as Problem-text Aa in Neugebauer and Sachs, MCT, p. 42. The intimacy of relation between the two texts can be seen from

Step	YBC. 6295	VAT 8547	Step
		$(a^3 - 0;7,30)$	I
I	a^3 0;7,30	$(a^3 - 0;7,30)$ 0;7,30	II
II	$\sqrt[3]{0;7,30} = 0;30$	$\sqrt[3]{0;7,30} = 0;30$	III
III	$\overline{0;7,30} = 8$	$\overline{0;7,30} = 8$	IV
IV	$8a^3 = \frac{a^3}{0;7,30}$	$\frac{(a^3 - 0;7,30) + 0;7,30}{0;7,30} = \frac{a^3}{0;7,30}$	V
V	$\sqrt[3]{\frac{a^3}{0;7,30}} = m$	$\sqrt[3]{\frac{a^3}{0;7,30}} = m$	VI
VI	$m \cdot 0;30 = \sqrt{\frac{a^3}{0;7,30}} \cdot \sqrt[3]{0;7,30} = \sqrt[3]{a^3}$	$m \cdot 0;7,30 = \sqrt[3]{\frac{a^3}{0;7,30}} \cdot \sqrt[3]{0;7,30} = \sqrt[3]{a^3} = a$	VII

the juxtaposition, on p. 155, of the various steps recommended by each tablet (a is the final result, and 0;7,30 is the auxiliary number employed in both texts[11]).

It is assumed in both cases that one already knows m from a table of cube roots. Step V in the method used in VAT 8547 is not represented above in the form given in the text, where (a^3 − 0;7,30) and 0;7,30 of the numerator are merely juxtaposed, not added. Here we are placed in a quandary. If we do *not* insert the operation of addition here, we must deny the numerical result given for Step V and must eliminate Steps VI and VII. If, on the other hand, we assume the addition in the numerator of Step V, it makes no sense to have created an artificial (a^3 − 0;7,30) only to reduce it again to a^3 by adding 0;7,30. Unless VAT 8547 is a confused student's application of the method behind YBC 6295, it seems possible that he may have had in mind another method, involving (a^3 − 0;7,30), but telescoped it toward the end with the method of YBC 6295. In any case, VAT 8547 makes no sense whatsoever if taken absolutely literally and assuming that nothing has been omitted.

The a's and m's involved in the two texts are

	a	m
YBC 6295	1;30	3
VAT 8547	3	6
	4	8
	5	10
	6	12

This makes it evident at once that if one uses 0;7,30 = $\sqrt[3]{0;30}$ as the auxiliary number, it is assumed that, in order to find the requested cube root a, one already knows the cube root of $(2a)^3$ from a table of cubes[12] or elsewhere. We must await the evidence of new texts to find out whether Babylonian mathematics advanced beyond this crude level in developing methods of finding cube roots.

11. The placing of the sexagesimal semicolon is arbitrary.

12. See the subject indices of MKT and MCT for the extant tables.

F. Schmidtke, Der Aufbau der Babylonischen Chronologie. (Orbis Antiquus 7). Aschendorffsche Verlagsbuchhandlung. Münster, Westfalen, 1952. 104 pp. + 4 plates.

Since discoveries in Syria and Upper Mesopotamia have furnished new possibilities for coordinating Babylonian and Assyrian events and for controlling Mesopotamian chronology by means of Egyptian synchronisms the chronology of Ancient Near Eastern History has been much discussed. The result has been a lowering of Mesopotamian dates. The arguments set forth are rather involved and, to this date, no agreement has been reached. In England and in part of Europe the solution of Sidney Smith (Hammurapi 1792–1750) is most popular. German scholars favor that of Cornelius which accidentally coincides with that of Albright (Hammurapi 1728–1686). There are still lower proposals, but more recently a reaction against excessive lowering has set in and the thesis of Thureau-Dangin (Hammurapi 1848–1806) has been defended with new arguments. For each of these proposals reasons exist which must be critically appraised.

Schmidtke's book gives little indication of a critical attitude. For him the question is already solved in favor of the thesis of Cornelius. His recipe is this: take the Khorsabad kinglist after restoring there for kings No. 65 and 66 (for whom figures are lost on the original) 25 years and you arrive by counting back from the Assyrian kings of the late empire at 1753–1721 for Šamši-Adad I of Assur. According to the Mari texts Hammurapi of Babylon is Šamši-Adad's younger contemporary and was in his 10th year when the Assyrian died; hence Hammurapi 1730–1688. The history of the Kassites, the Mitannians and the Hittites is to be adjusted accordingly.

Cornelius based his chronology on Berossus (3rd cent. B. C.), Schmidtke confirms him by a perusal of the official chronology of the late Assyrian kings (the date of the king list is 738 B. C.). Berossus' reliability is suspect from the outset, and the critical investigator must ask whether the Khorsabad kinglist represents the absolute historical truth. Wherever possible its data ought to be checked against the evidence of sources which are contemporary with the events they report or as close to them as possible. Back to the Amarna age the kinglist is reliable. However, there are grave doubts as to whether this statement can be extended beyond that time. In other words, the true age of Šamši-Adad I of Assur, and thereby that of Hammurapi, cannot be computed by simply adding up the figures contained in the Khorsabad kinglist.

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